REMARKS

Claims 1-9 are pending in this application, with Claims 1 and 5 being independent.

Claims 1, 3-5 and 7-9 were rejected under 35 U.S.C. § 103(a) as allegedly obvious over Lin (U.S. Patent No. 5,764,263) in view of Tanuma et al. (U.S. Patent No. 6,166,122). Claims 2 and 6 were rejected under 35 U.S.C. § 103(a) as allegedly obvious over Lin '263 in view of Tanuma et al. and further in view of Kondo et al. (U.S. Patent No. 6,000,794). Applicants respectfully disagree with these rejections.

Before addressing the merits of the rejections, Applicants believe it will be helpful to review some features and advantages of the present invention. The present invention, as recited in Claim 1, relates to an ink-jet recording system comprising a recording medium and an ink-jet printing apparatus comprising ink containers in which a plurality of pigment inks are contained, and ink-jet heads for ejecting the respective pigment inks towards the recording medium. The recording medium is provided with an ink-receiving layer having porous structure on a base material. The ink-receiving layer comprises alumina hydrate particles and resinous binder, and has a pore volume of 0.1 to 1.0 ml/g. The ink-receiving layer has a thickness of at least 15 μm. Each of the pigment inks comprises pigment particles and a resin in an aqueous medium, and comprises 30 to 70% water by weight based on the total weight of the ink. In each of the pigment inks, the diameter of the pigment particles falls within a range of from 10 to 500 nm, and the proportion of the pigment particles having a diameter of 300 to 500 nm based on the total number of pigment particles in the ink is at most 30%. As recited in Claim 5, the present invention also relates to an ink-jet recording method of comparable scope.

Thus, the present invention uses a recording medium having particular properties and an aqueous pigment ink having particular properties in combination, and provides an ink-jet recording system that has excellent coloring properties and ink absorbency, as well as excellent rub-off resistance and water-fastness. The importance of this combination is readily understood from the evaluation results of the Examples and Comparative Examples of this application. In Applicants' view, the cited references do not teach or suggest the claimed invention.

Lin '263 teaches incorporating a pigment and a resin in an aqueous ink. The examples of suitable pigments listed in Lin '263 include a wide variety of pigments. (See cols. 15 and 16 of Lin '263.) The preferable particle diameter of the pigment is stated to be in the range of about 0.001 to about 5 μm (1-5000 nm), and the narrowest preferable range is stated to be from about 0.01 to about 1.2 μm (10-1200 nm). (See col. 17, lines 18-21.) In contrast, the maximum pigment particle diameter as specified in the present invention is 500 nm.

Applicants note that in Comparative Example 4 of this application, the yellow pigment has a maximum particle diameter of 625.5 nm (Yellow Ink 4, see Table 1 on page 34) and the cyan pigment has a maximum particle diameter of 583.9 nm (Cyan Ink 3, see Table 1 on page 34), which are outside the scope of the present invention and are about in the middle of the narrowest range of particle diameters disclosed in Lin '263 (and far towards the lower end of the general range). Even so, the difference in effects (namely, rub-off resistance) between particle diameters inside and outside the claimed scope is clearly demonstrated. (See Table 2, page 38.)

The statement in Lin '263 that more preferably, 70% of the pigment particles have a particle diameter of below 300 nm, with no pigment particles being greater than 1000 to 1200

nm, does not teach or suggest the claimed feature of the present invention. Applicants note that this statement implies the presence of particles having a particle diameter of over 500 nm, which is the maximum diameter specified in Claims 1 and 5. Even if less than 30% of the pigment particles have a particle diameter of 300 to 500 nm, Applicants submit that the beneficial effects of the present invention cannot be achieved when there are particles having a particle diameter of over 500 nm — as can be seen from the results of the Examples and Comparative Example 4 of the present application.

Moreover, the benefits provided by the pigment particle diameter as specified in Lin '263 are stability of the ink and prevention of nozzle clogging, which are merely due to the small particle diameter. (See col. 17, lines 13-18.) Thus, Lin '263 does not teach or suggest the benefits of the present invention that are obtained by the interactive relationship between the properties of the ink and the properties of the recording medium.

Furthermore, Lin '263 discloses that dye may be used as the colorant, rather than pigment. (See col. 14.) Hence, the pigment is not an essential element of the Lin '263 invention.

Tanuma et al. discloses a recording medium wherein the porous layer preferably has a pore volume of 0.3 to 2.0 ml/g. Thus, the upper limit of the preferable pore volume range in Tanuma et al. is 2.0 ml/g, which is twice the upper limit of the pore volume recited in Claims 1 and 5 of the present invention. The recording medium of Comparative Example 1 of the present application (Recording Medium 2, see page 26, line 19) has a pore volume of 1.7 ml/g. Accordingly, the range disclosed by Tanuma et al. includes values that correspond to a Comparative Example of the present application as well as to inventive Examples. The

difference in effect can be recognized from the "C" rating in the "Saturation of Image" evaluation for Comparative Example 1, as reported at Table 2, page 38 of the present specification.

Tanuma et al. does not teach or suggest the pigment ink with specific features as recited in the present invention; it merely states that the recording sheet is printed with inks having water-soluble colorants.

Therefore, Applicants conclude that not only does Tanuma et al. not teach or suggest all the features of the claimed recording medium, it also does not provide any motivation to combine the recording medium disclosed therein with ink disclosed in Lin '263, let alone with ink that has pigment particles of 10 to 500 nm in diameter.

As explained above, both Lin '263 and Tanuma et al. include values for certain parameters that were used in Comparative Examples of the present application. No motivation for selecting the claimed combination of ink pigment particle diameter and ink-receiving layer pore volume can be found in either reference. Moreover, the criticality of the combination claimed in the present invention is supported by the Examples and Comparative Examples, and Applicants submit that the present invention is not obvious over these references.

Kondo et al. is cited against Claim 2 and 6 as teaching an ink-receiving layer having a BET specific surface area within a range of from 20 to 300 m^2/ml. Although it discloses an ink-receiving layer having a pore volume of from 0.1 to 1.0 ml/g, it does not teach or suggest anything about the diameter of pigment particles in an ink. (Dye inks are used in Kondo et al.; see col. 12, lines 50-60.) Applicants submit that neither Kondo et al. nor any of the other references that were made of record but not relied upon remedy at least this deficiency of the Lin '263 and Tanuma et al. combination.

Applicants conclude that the cited references do not teach or suggest the claimed invention, and respectfully request that the Section 103 rejections be withdrawn.

Applicants submit that the present invention is patentably defined by independent Claims 1 and 5 for the reasons discussed above. The dependent claims are also submitted to be patentable for the same reasons as their respective independent claims and because they set forth additional aspects of the present invention. Individual consideration of each dependent claim is requested.

Applicants request favorable reconsideration, withdrawal of all rejections and passage to issue of the above-identified application.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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